According to calculations based upon various furnaces in service, it was found that the time during which the waste gases remained in the furnace varies from a fraction of a second to 3, 5, 7, and up to 10 seconds. The determination of the length of time which the gases must remain in the furnace chamber is based upon the following considerations :

Computations may be made which will give the theoretical calorific intensity obtained by the combustion of a coal with an assumed excess of air—for example, the combustion of the best grade of Donietz basin coal, with an excess of 73.3 per cent of air over that theoretically required will give a calorific intensity of 1400°. If, for the designing of a continuous ingot heating furnace, it is assumed that there will be a temperature of 700° for the gases at the exit port, the total drop of temperature in the heating chamber will be 700°. If the drop in temperature of these gases per second is known, it is comparatively simple to determine the time the gases should remain in the heating chamber of the furnace.

According to those computations which have already been made—computations which at the best are only approximate—the following values have been found for the drop in temperature per second:

Open-hearth furnaces.....	200° per second
Continuous reheating furnaces. ..	150°-200°
Annealing furnaces.....	100°—150°
Chamber brick kilns.....	80°

It should not be considered that these values are perfectly established. Exact data covering the drop in temperature of the gases per second can only be obtained by a series of observations for each of the varieties of furnaces, using for this purpose furnaces *which are correctly designed and constructed.* This

last point presents the principal difficulty which exists at present.

It is evident that the drop in temperature per second of the gases in a furnace heating chamber is a function of:

(a) The losses by radiation, which are a function of the exposed surface of the furnace, the conductivity of the walls and the temperature of the hot gases on the inside of the chamber;